

FCC Part 15.247 Test Report
for
Western Multiplex
on the
Spread Spectrum Radio
Model: 31190
FCC ID: HZB-S24-12

Test Report #: J99028833b
Date of Report: December 14, 1999

Job #: J99028833
Date of Test: November 10 & 23 and December 14, 1999

Total No. of Pages Contained in this Report: 19 + data pages



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FCC Part 15 DSSS Cert, Rev 9/99



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1.0 Summary of Tests

**MODEL:
FCC ID: HZB-S24-12**

TEST	REFERENCE	RESULTS
Max. Output power	15.247(b)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(d)	Pass
Out of Band Antenna Conducted Emission	15.247(c)	Pass
Out of Band Radiated Emission	15.247(c)	N/A
Radiated Emission in Restricted Bands	15.35(b)(c)	Pass
AC Conducted Emission	15.207	Pass
Radiated Emission from Digital Part	15.109	Pass
Radiated Emission from Receiver L.O.	15.109	Pass
Processing Gain Measurements	15.247(e)	Provided by applicant
Antenna Requirement	15.203	Pass

Test Engineer: Xi-Ming Yang
Xi-Ming YangDate: 1-17-2000EMC Site Manager: David Chernomordik
David Chernomordik, Ph.D.
EMC Site ManagerDate: 1/17/00

Glenayre Western Multiplex, Model No.
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2.0 General Description

2.1 Product Description

The EUT is a spread spectrum radio used for point-to-point fixed wireless interconnection.

A pre-production version of the sample was received on November 10, 1999 in good condition.

Overview of Spread Spectrum Radio

Applicant	Western Multiplex
Trade Name & Model No.	Western Multiplex / 31190
FCC Identifier	HZB-S24-12
Use of Product	Point-to-point fixed wireless interconnect
Manufacturer & Model of Spread Spectrum Module	Western Multiplex
Type of Transmission	Direct Sequence
Rated RF Output (mW)	190
Frequency Range (MHz)	2411.5 – 2461.0
Number of Channel(s)	2
Antenna(s) & Gain, dBi	27.5
Processing Gain Measurements	<input checked="" type="checkbox"/> Will be provided to ITS for submission with the application <input type="checkbox"/> Will be provided directly to the FCC reviewing engineer by the client or manufacturer of the spread spectrum module
Antenna Requirement	<input type="checkbox"/> The EUT uses a permanently connected antenna. <input type="checkbox"/> The antenna is affixed to the EUT using a unique connector which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector. <input checked="" type="checkbox"/> The EUT requires professional installation (attach supporting documentation if using this option).
Manufacturer name & address	Western Multiples 1196 Borregas Ave. Sunnyvale CA 94089

2.2 Related Submittal(s) Grants

Glenayre Western Multiplex, Model No.
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2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Data Sheet" of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is site 1. This test facility and site measurement data have been fully placed on file with the FCC and NVLAP accredited.

Glenayre Western Multiplex, Model No.
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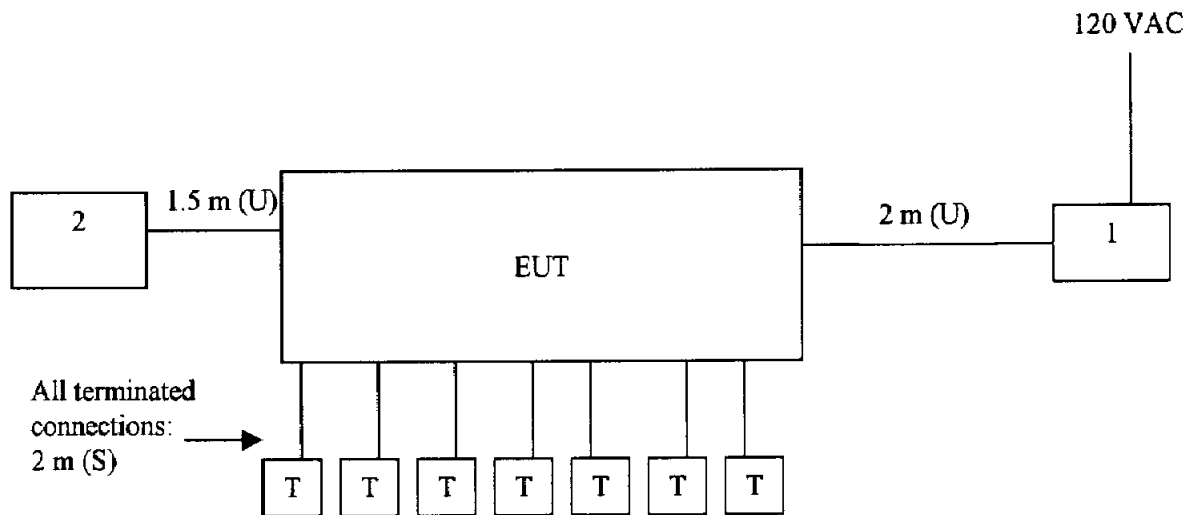
Date of Test: November 10& 23 and December 14, 1999

3.0 System Test Configuration

3.1 Support Equipment and description

Item #	Description	Model No.	Serial No.
1	DC Power Supply	TPS-4000	917003
2	Antenna	P-24A48G	N/A

3.2 Block Diagram of Test Setup



* = EUT	S = Shielded	F = With Ferrite
** = No ferrites on video cable	U = Unshielded	

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3.3 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

For radiated emission measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power without modulation.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Detector function is in peak mode. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.5 Mode of Operation During Test

For emissions testing, the EUT was setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. The transmittign signal was set to low, middle, and high frequencies.

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3.6 Modifications Required for Compliance

The following modifications were installed during compliance testing in order to bring the product into compliance (Please note that this list does not include changes made specifically by Glenayre Western Multiplex prior to compliance testing):

No modifications were made by Intertek Testing Services

3.7 Additions, deviations and exclusions from standards

No additions, deviations, or exclusions were made to the standard.

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4.0 Measurement Results

4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b):

The antenna port of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for maximum RES BW and power was read directly in dBm. External attenuation and cable loss were compensated for using the OFFSET function of the analyzer.

For antennas with gains of 6 dBi or less , maximum allowed transmitter output is 1 watt (+30 dBm).

For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6)/3 dB.

Max. antenna gain = 27.5		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2411.5	22.8	190.5
High Channel: 2461.0	22.8	190.5

Cable loss: 0 dB

External Attenuation: 0 dB

Cable loss, external attenuation:

included in OFFSET function
 added to SA raw reading

EUT maximum allowed peak output power = $30 - (27.5 - 6) / 3 = 22.8$ dBm

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4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

Frequency (MHz)	Min. 6 dB Bandwidth (kHz)
2461.0	1158.0

Refer to the following plots for 6 dB bandwidth sharp:

Plot 2a: Low Channel 6 dB RF Bandwidth

Plot 2b: High Channel 6 dB RF Bandwidth

2.2

HP

REF 21.0 DBm

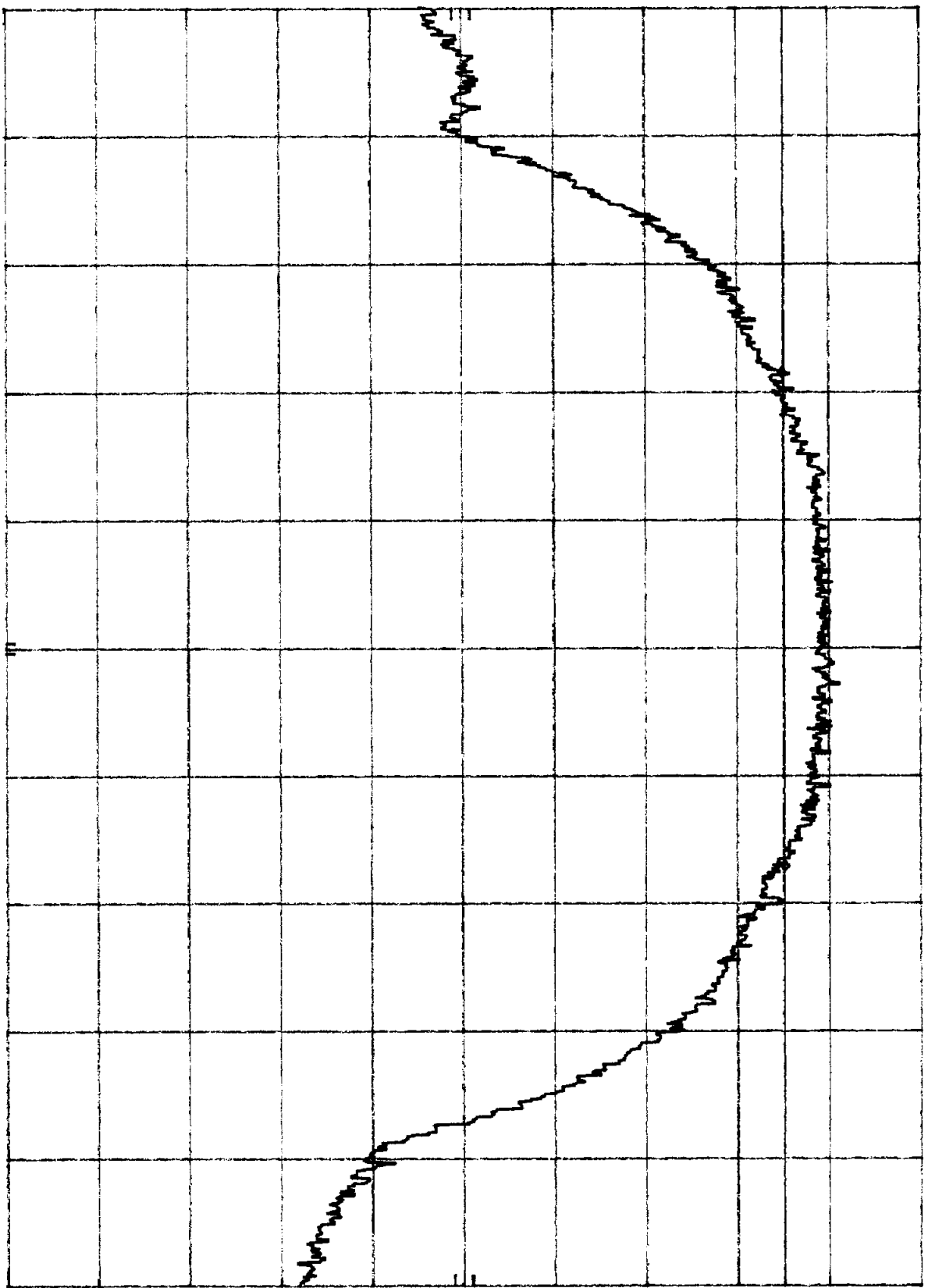
ATTEN 40 DB

MKR Δ 12.50 MHz
0.30 DB

10 DB/

OFFSET
1.0
DB

DL
6.1
DBm



CENTER 2.414 0 GHz
RES BW 100 KHZ
VBW 100 KHZ
SPAN 32.4 MHz
SWP 20.0 msec

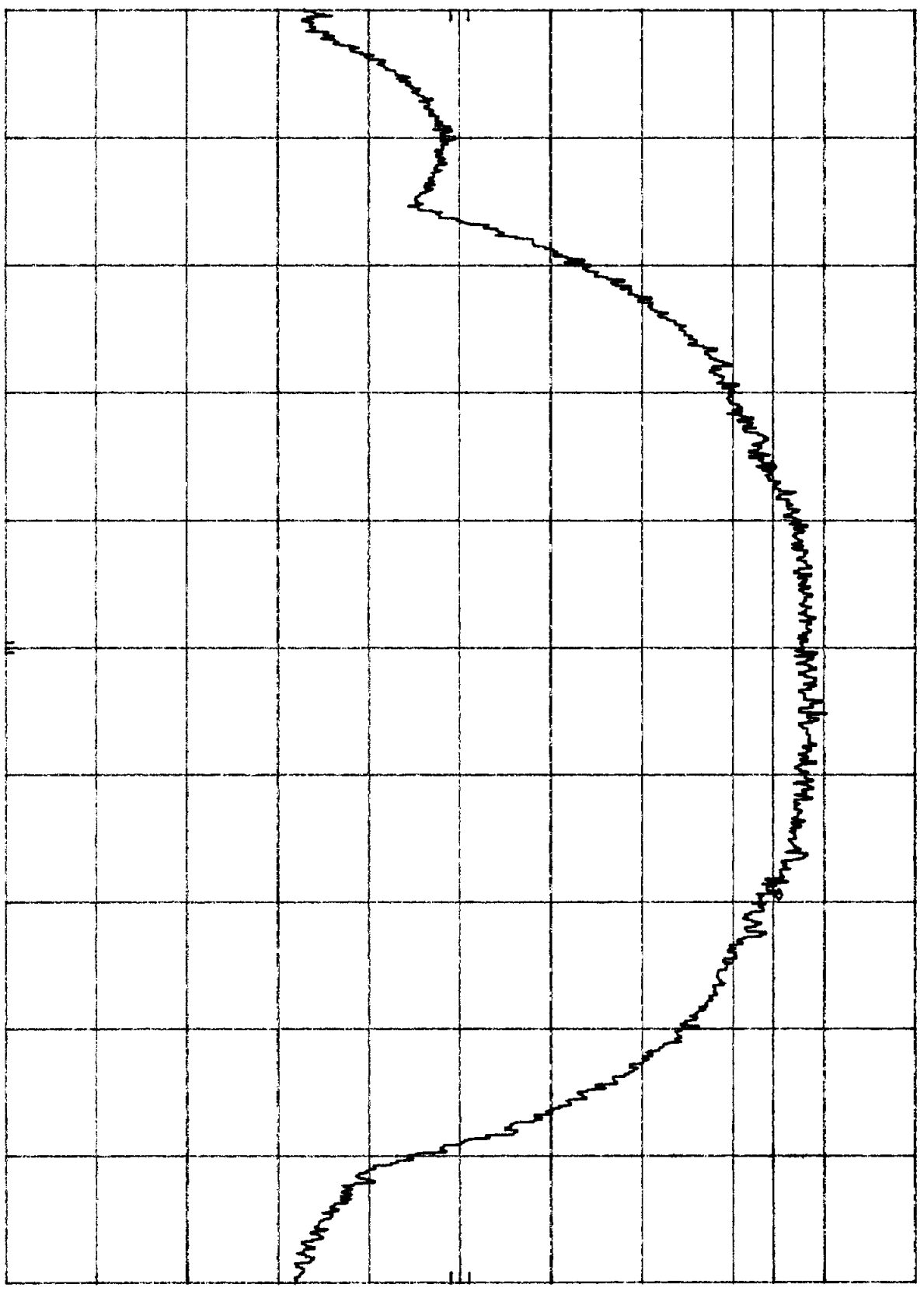
2.6

HP REF 22.0 DBm ATTEN 40 DB MKR Δ 11.58 MHz

10 DB/

OFFSET
1.0
DB

DL
6.4
DBm



CENTER 2.462 4 GHz RES BW 100 KHz VBW 100 KHz SPAN 34.5 MHz SWP 20.0 msec

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4.3 Maximum Power Density Reading, FCC Rule 15.247(d):

The spectrum analyzer RES BW was set to 3 kHz. The START and STOP frequencies were set to the band edges of the maximum output passband. If there is no clear maximum amplitude in any given portion of the band, it may be necessary to make measurements at a number of bands defined by several START and STOP frequency pairs. The specification calls for a 1 second interval at each 3 kHz bandwidth; total SWEEP TIME is calculated as follows:

$$\text{SWEEP TIME (SEC)} = (\text{Fstop, kHz} - \text{Fstart, kHz}) / 3 \text{ kHz}$$

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Frequency (MHz)	Power Density (dBm)
2463.78	-1.9

Frequency Span = 1200 kHz

Sweep Time = 1200 Frequency Span / 3 kHz
= 400 seconds

Refer to the following plots for power density data:

Plot 3.a.1-3.a.2: Low Channel Power Density
Plot 3.b.1-3.b.d: High Channel Power Density

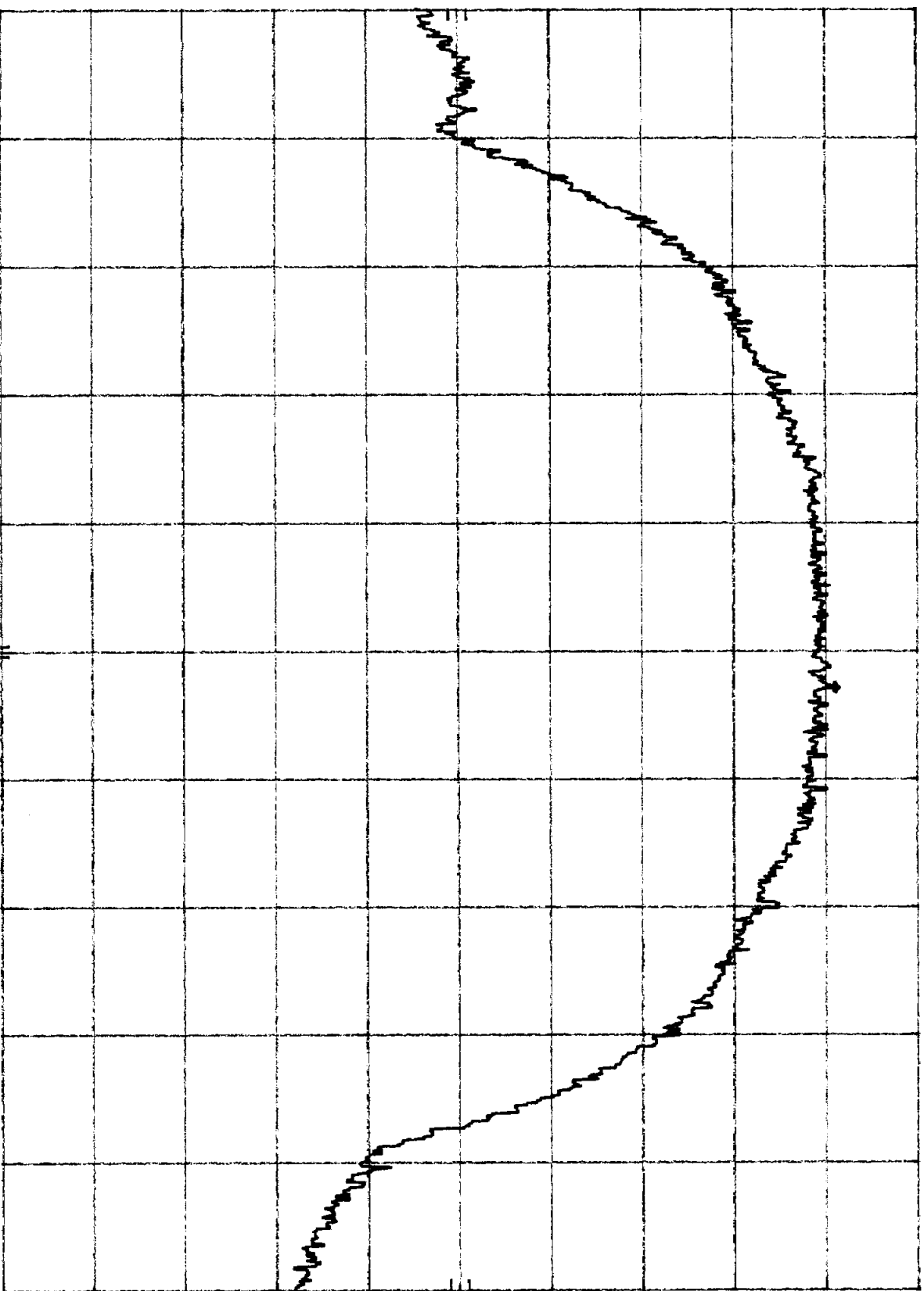
32.1

HP REF 21.0 DBM ATTEN 40 DB

MKR 2.414 90 GHZ
12.10 DBM

10 DB/

OFFSET
1.0
DB



CENTER 2.414 0 GHZ
RES BW 100 KHZ
VBW 100 KHZ
SPAN 32.4 MHZ
SWP 20.0 msec

3.0.2

HP

REF 21.0 dBm

ATTEN 40 DB

MKR 2.414 903 GHz
-4.60 dBm

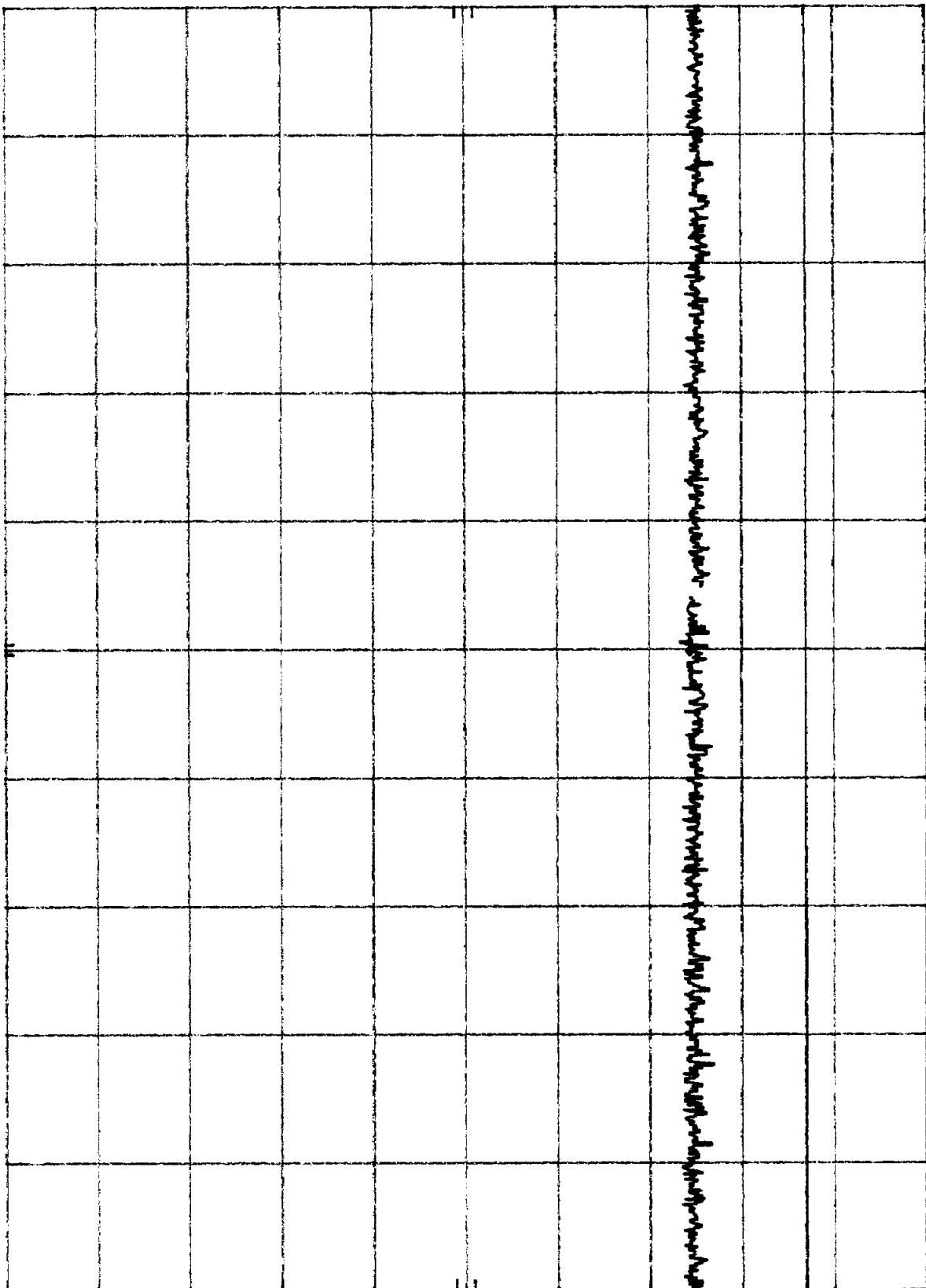
10 DB/

OFFSET

1.0
dB

DL

8.0
dBm



CENTER 2.414 90 GHz

RES BW 3 KHz

VBW 3 KHz

SPAN 1.20 MHz
SWP 400 sec

3, b, 1

HP

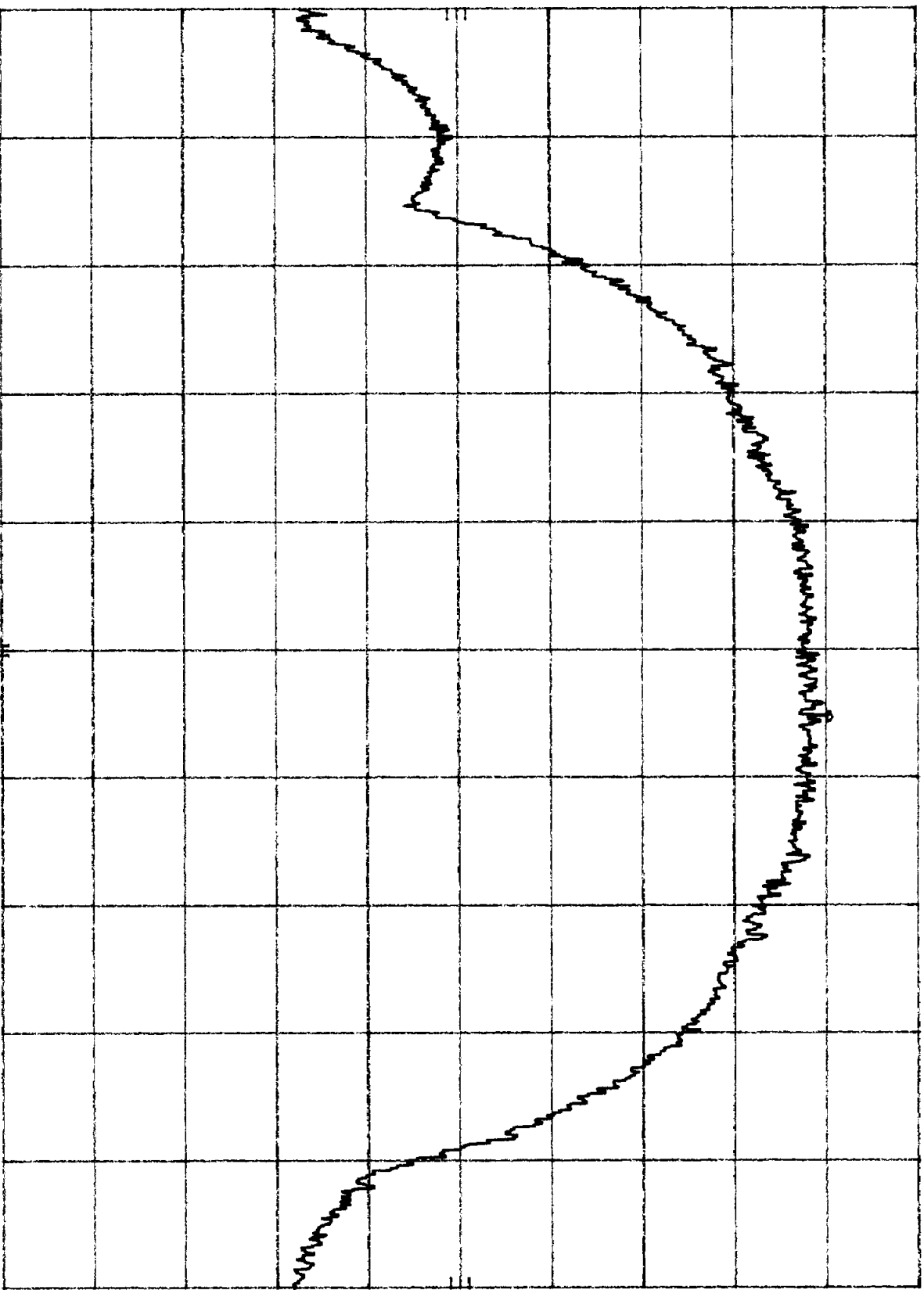
REF 22.0 DBM

ATTEN 40 DB

MKR 2.464 19 GHZ
12.40 DBM

10 DB/

OFFSET
1.0
DB



CENTER 2.462 4 GHZ
RES BW 100 KHZ

VBW 100 KHZ

SPAN 34.5 MHZ
SWP 20.0 msec

3.6.2

MKR 2.463 760 CHZ
-1.90 DBm

HP

REF 22.0 DBm ATTEN 40 DB

10 DB/

OFFSET

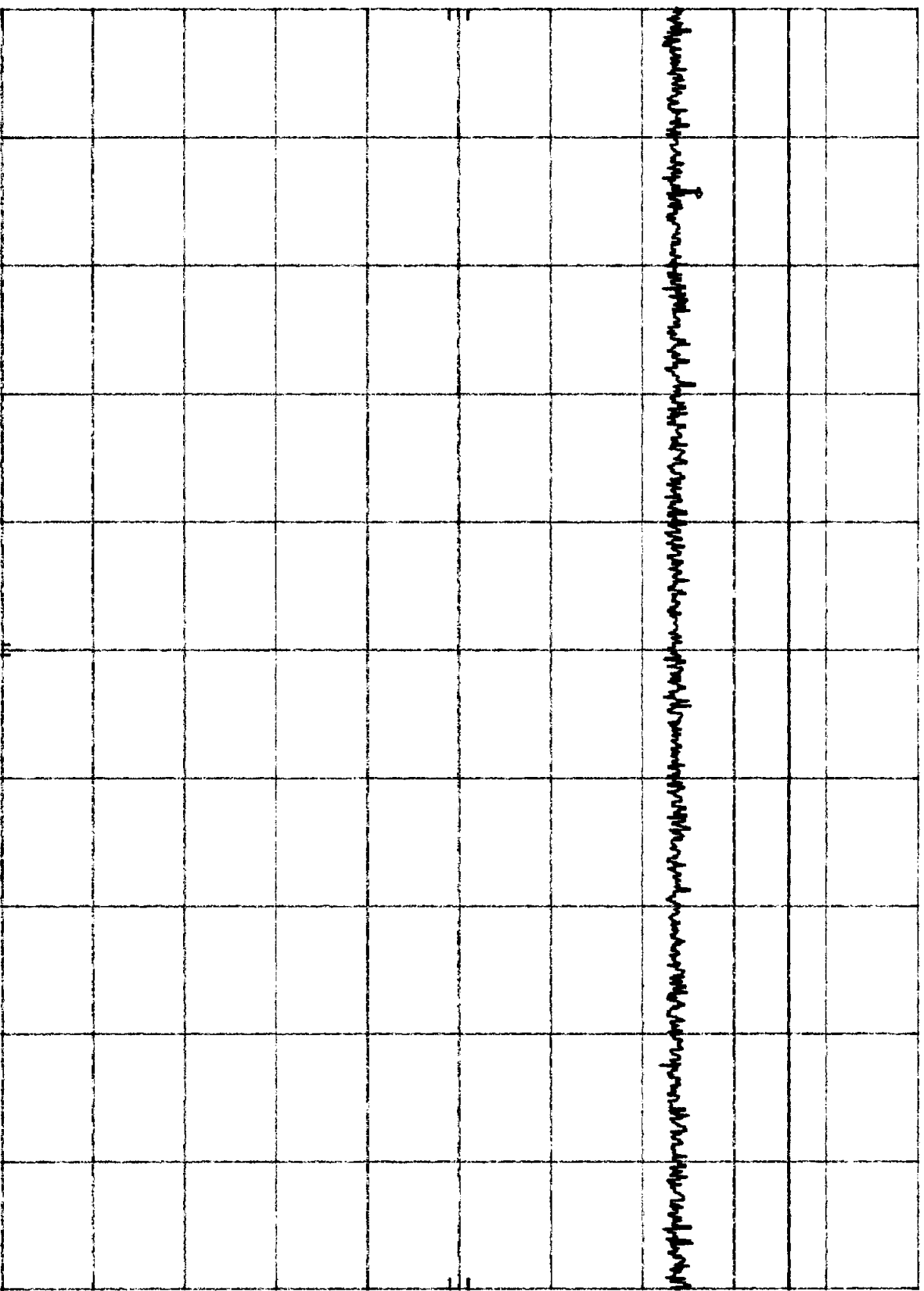
1.0

DB

DL

8.0

DBm



CENTER 2.464 18 GHZ

RES BW 3 KHZ

VBW 3 KHZ

SPAN 1.20 MHZ
SWP 400 sec

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4.4 Out of Band Conducted Emissions, FCC Rule 15.247(c):

In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, or else shall meet the general limits for radiated emissions at frequencies outside the passband, whichever results in lower attenuation.

All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

Refer to the following plots for out of band conducted emissions data:

Plot 4.a.1 – 4.a.7: Low Channel Emissions

Plot 4.b.1 – 4.b.7: High Channel Emissions

4.2.1

MKR 986 MHz
-45.80 DBm

HP

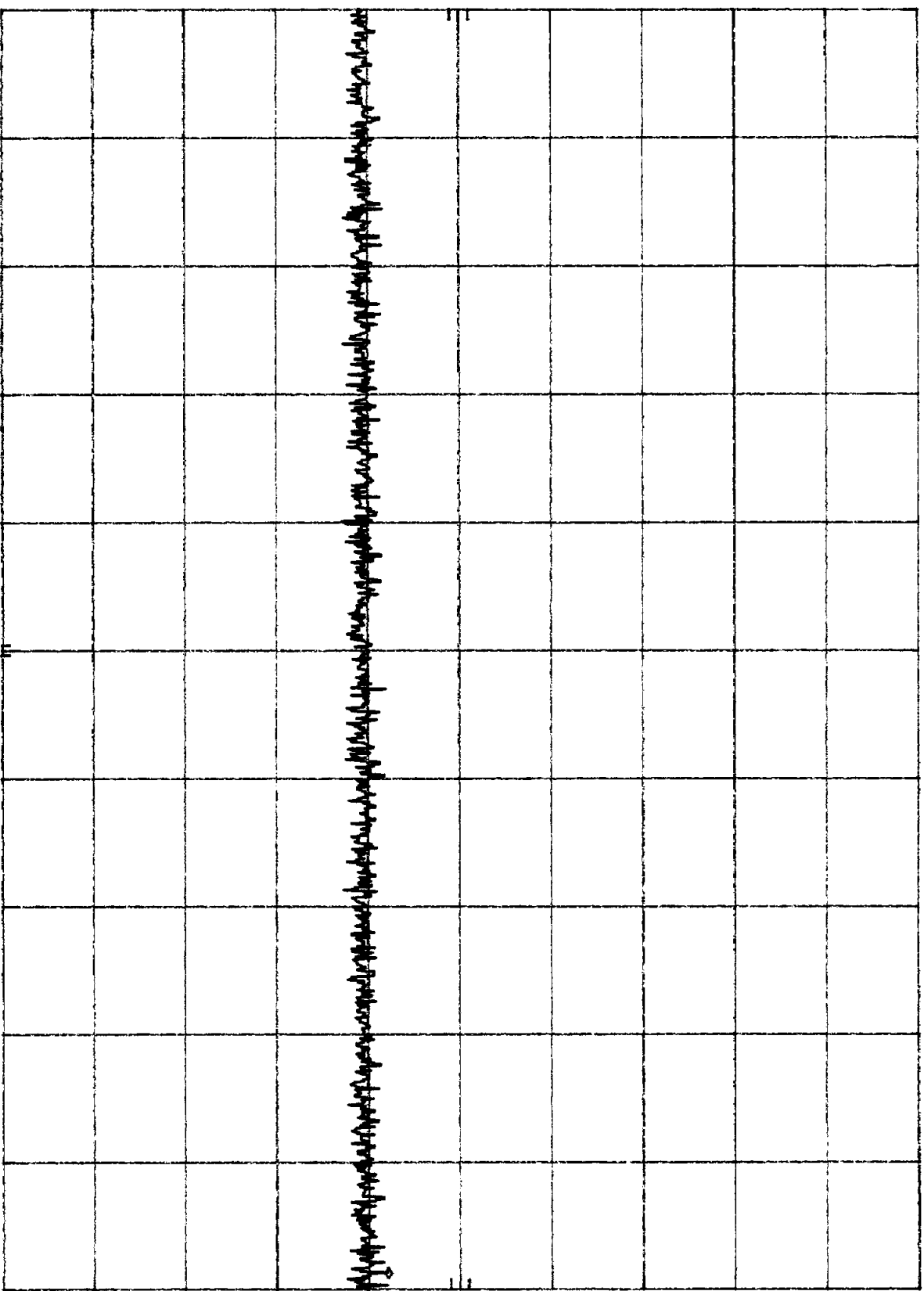
REF 12.0 DBm ATTEN 40 DB

10 DB/

OFFSET

1.0

DB



START 1 MHz

RES BW 100 KHZ

VBW 100 KHZ

STOP 1.00 GHz
SWP 300 msec

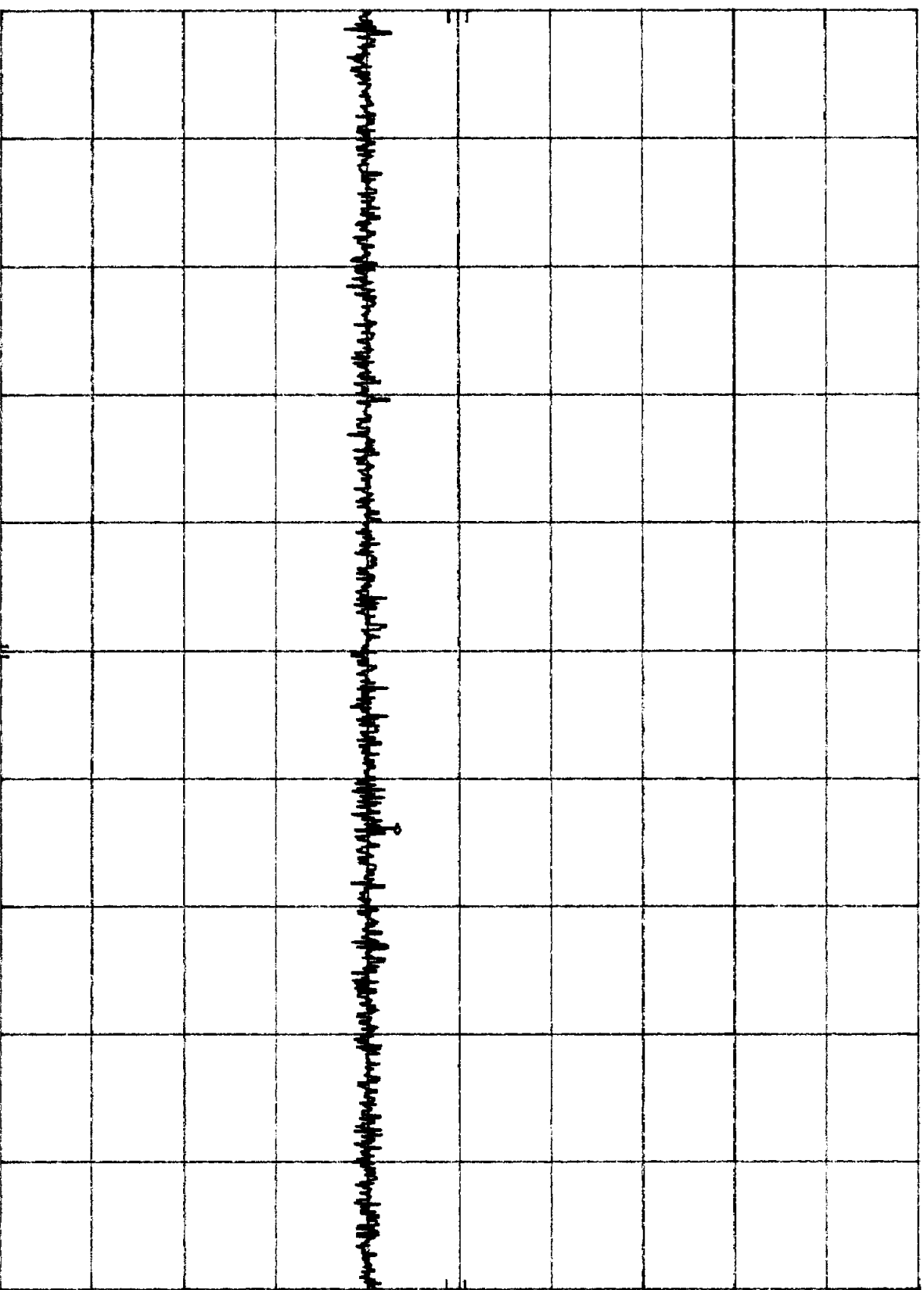
4.2.2

MKR 1.855 GHz
-44.50 dBm

HP REF 12.0 dBm ATTEN 40 dB

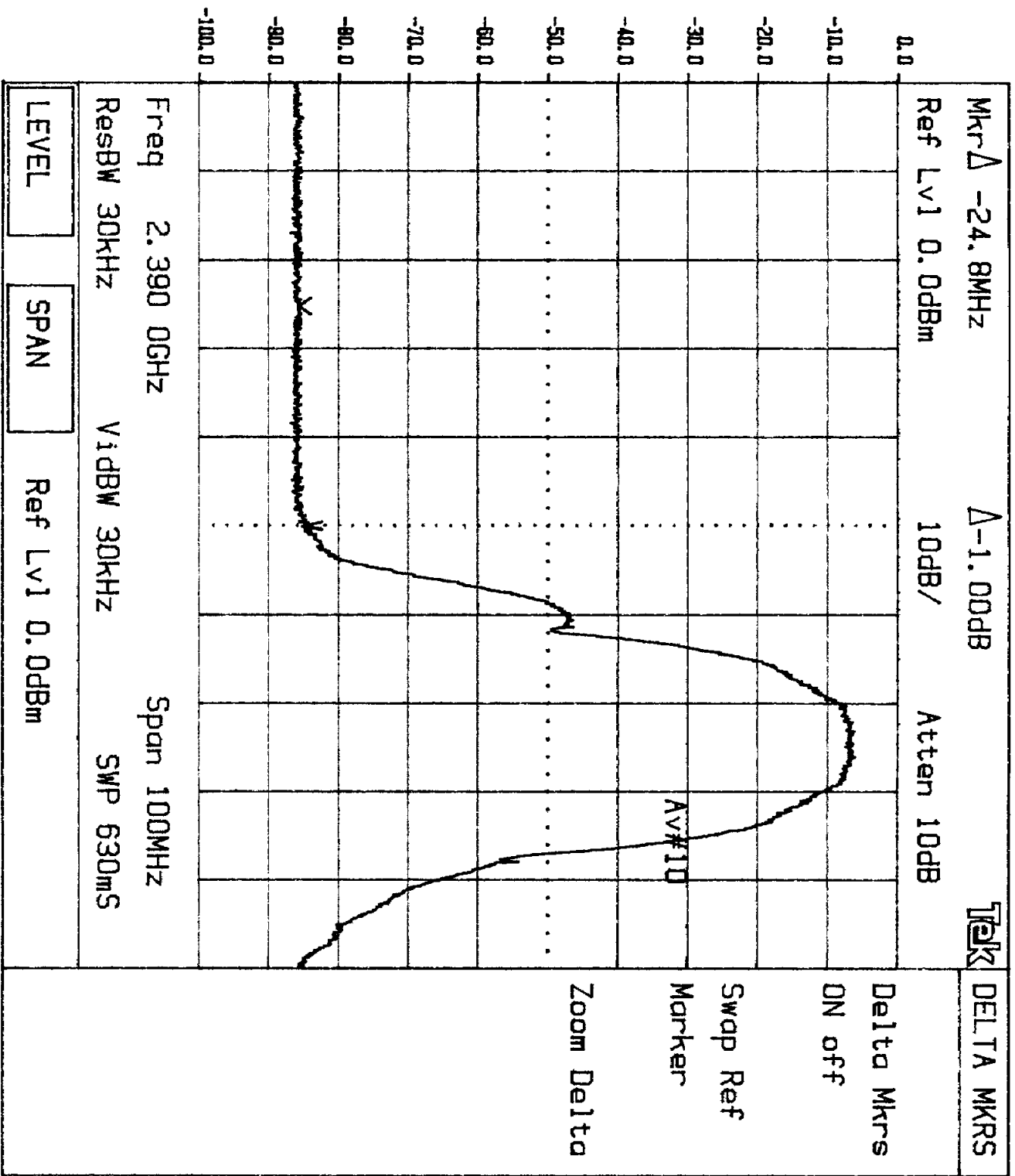
10 dB/

OFFSET
1.0
dB



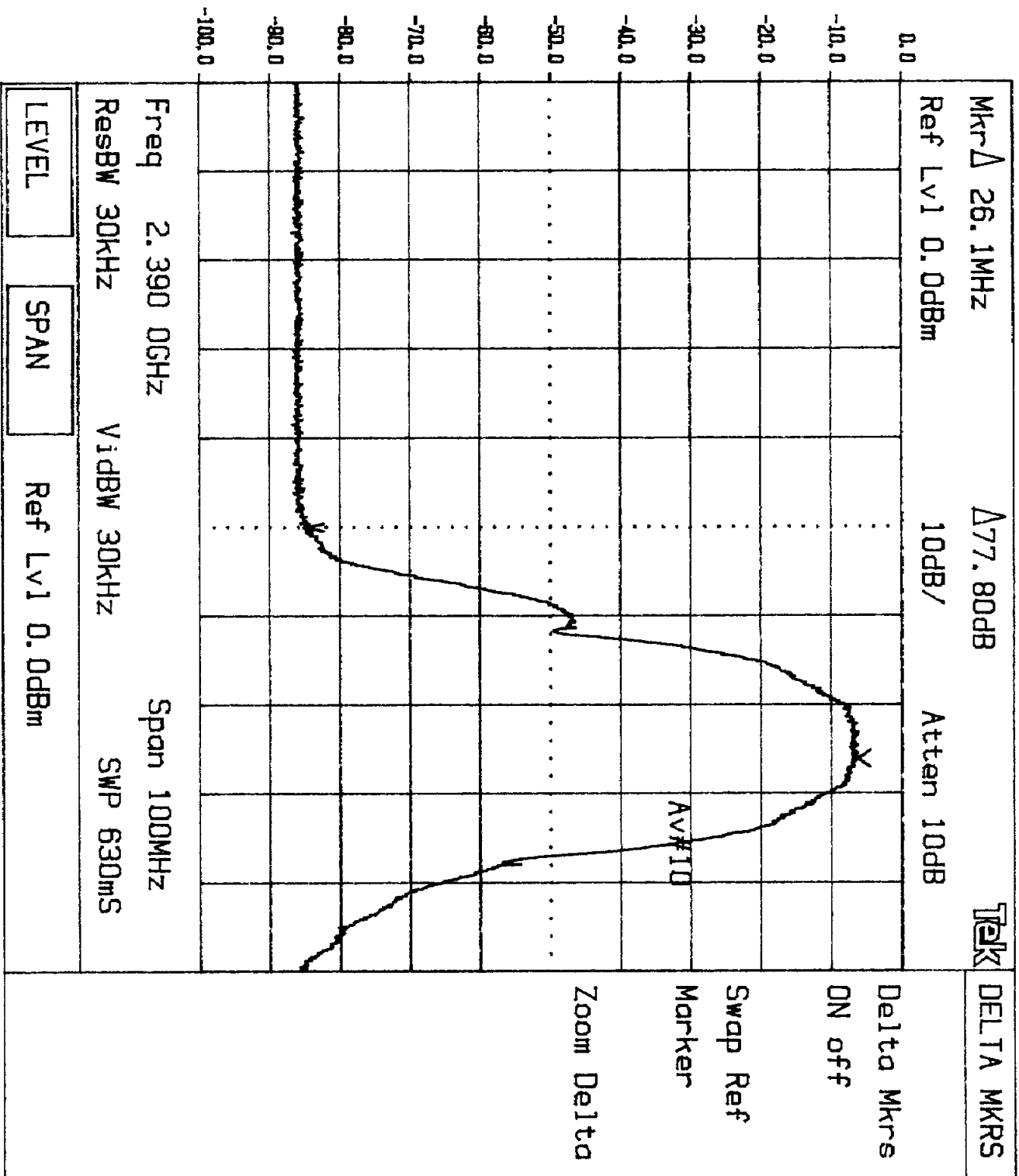
START 1.00 GHz STOP 2.34 GHz
RES BW 100 KHZ VBW 100 KHZ SWP 402 msec

4.2.3



KN08 2 KN08 1 KEYPAD Taktronix 2784

4.2.4



HP REF 12.0 DBm

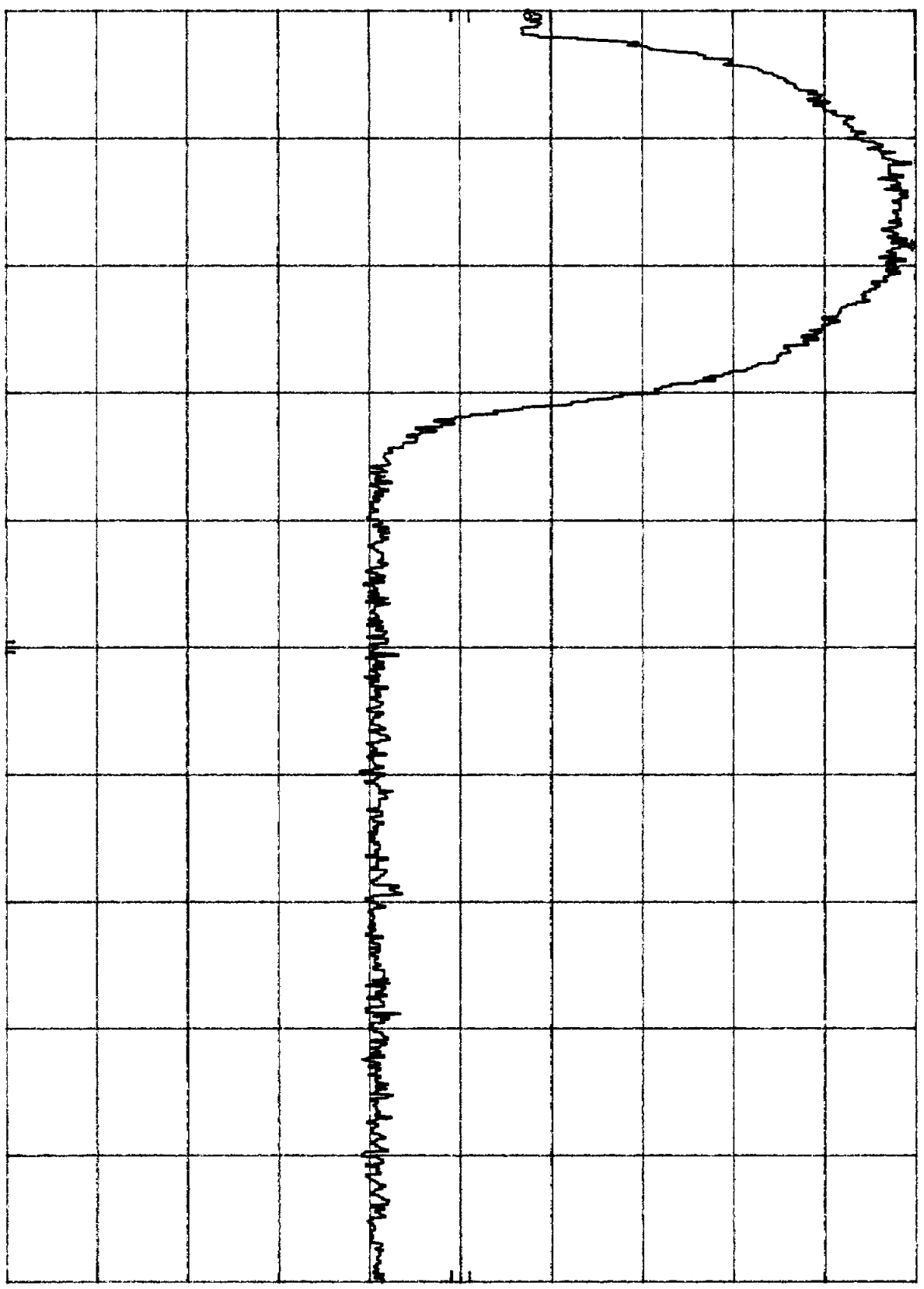
ATTEN 40 DB

4.2.5

MKR Δ-15.36 MHz
-42.20 DB

10 DB/

OFFSET
1.0
DB



START 2.400 GHz
RES BW 100 KHz

VBW 100 KHz

STOP 2.483 GHz
SWP 25.1 msec

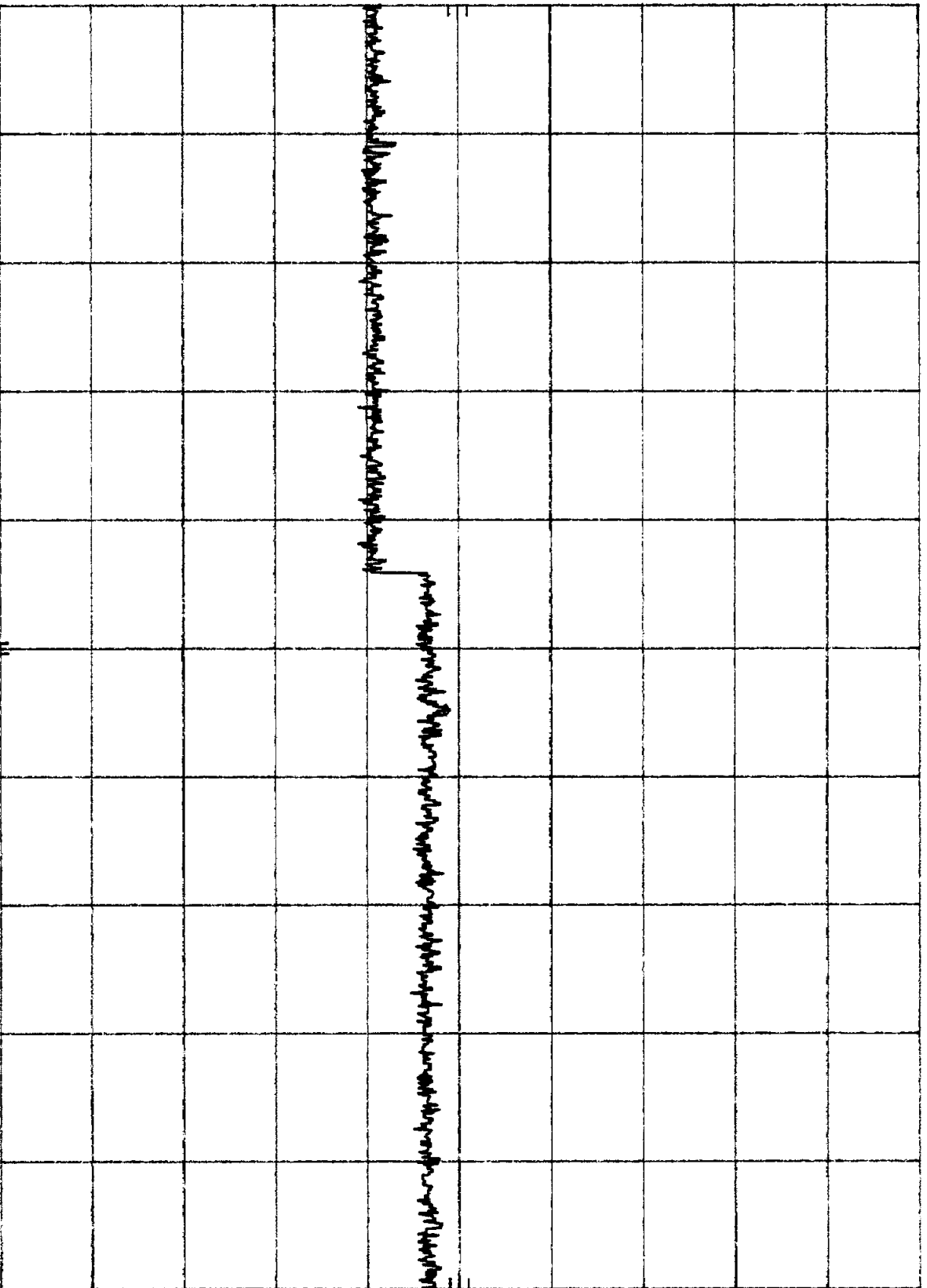
4.a.6

MKR 6.595 GHz
-39.40 dBm

HP REF 12.0 dBm ATTEN 40 dB

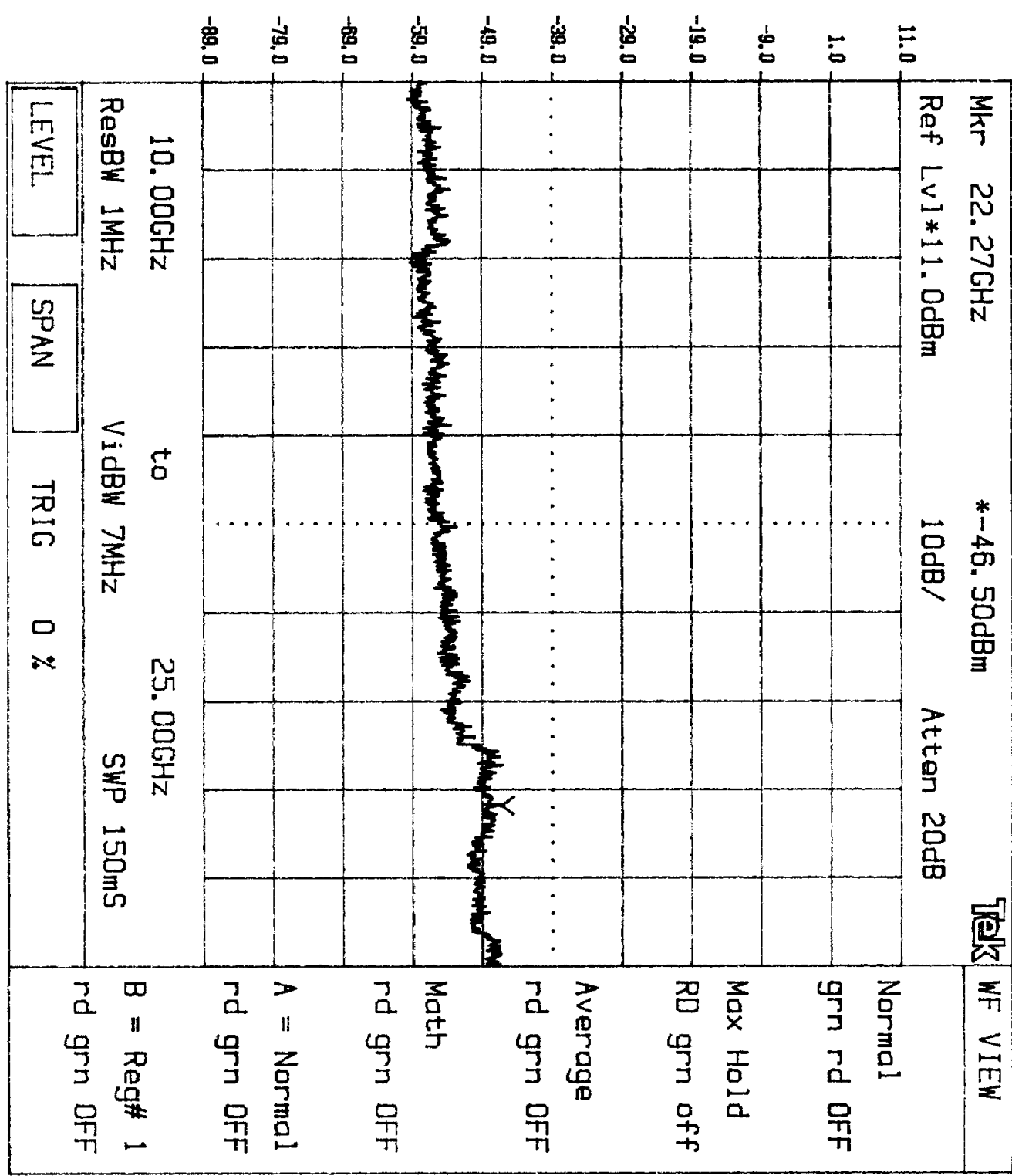
10 dB/

OFFSET
1.0
dB



START 2.48 GHz RES BW 100 KHz VBW 100 KHz STOP 10.00 GHz
SWP 2.25 sec

4.0.7



KN08 2 KN08 1 KEYPAD Tektronix 2784

HP

REF 12.0 dBm

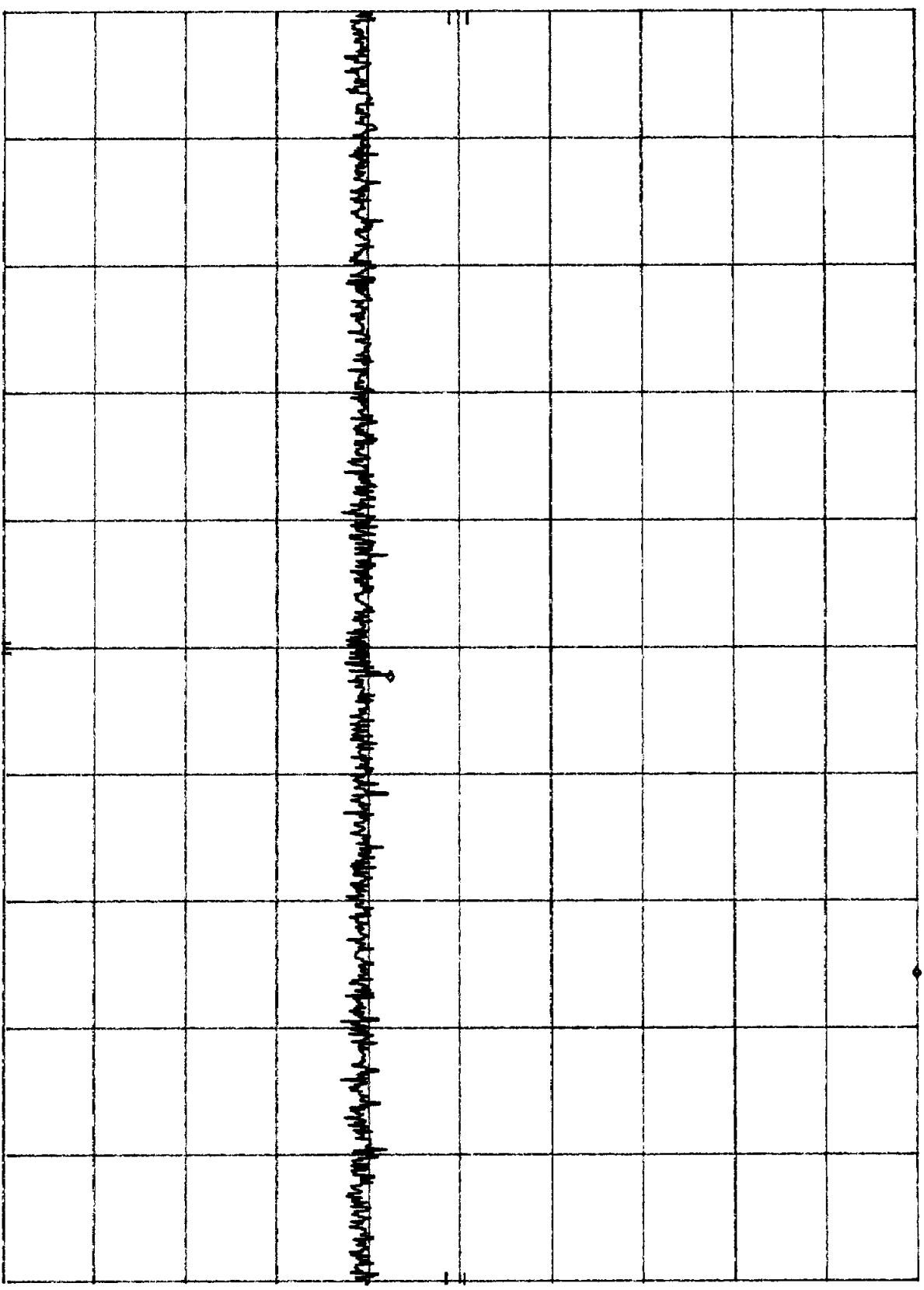
ATTEN 40 DB

4.6.1

MKR Δ-232 MHz
-57.90 DB

10 DB/

OFFSET
1.0
DB



START 1 MHz

RES BW 100 KHZ

VBW 100 KHZ

STOP 1.00 GHz
SWP 300 msec

HP

REF 12.0 dBm

ATTEN 40 DB

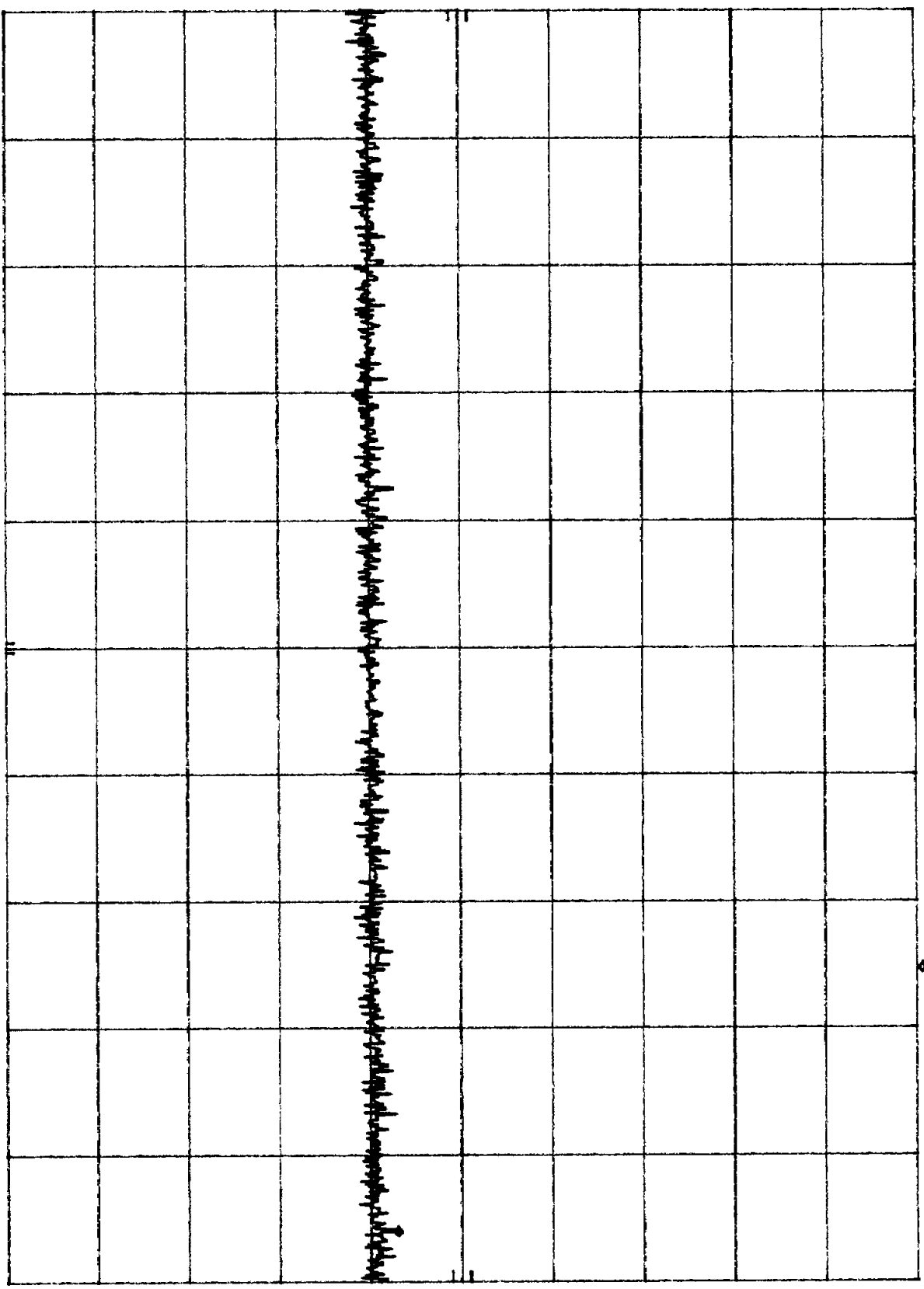
4.b.2

MKR Δ 290 MHz
-57.60 DB

10 DB/

OFFSET
1.0

DB



START 1.00 GHz

RES BW 100 KHZ

VBW 100 KHZ

STOP 2.40 GHz
SWP 420 msec

HP

REF 12.0 dBm

ATTEN 40 DB

4.b.3

MKR Δ 20.71 MHz

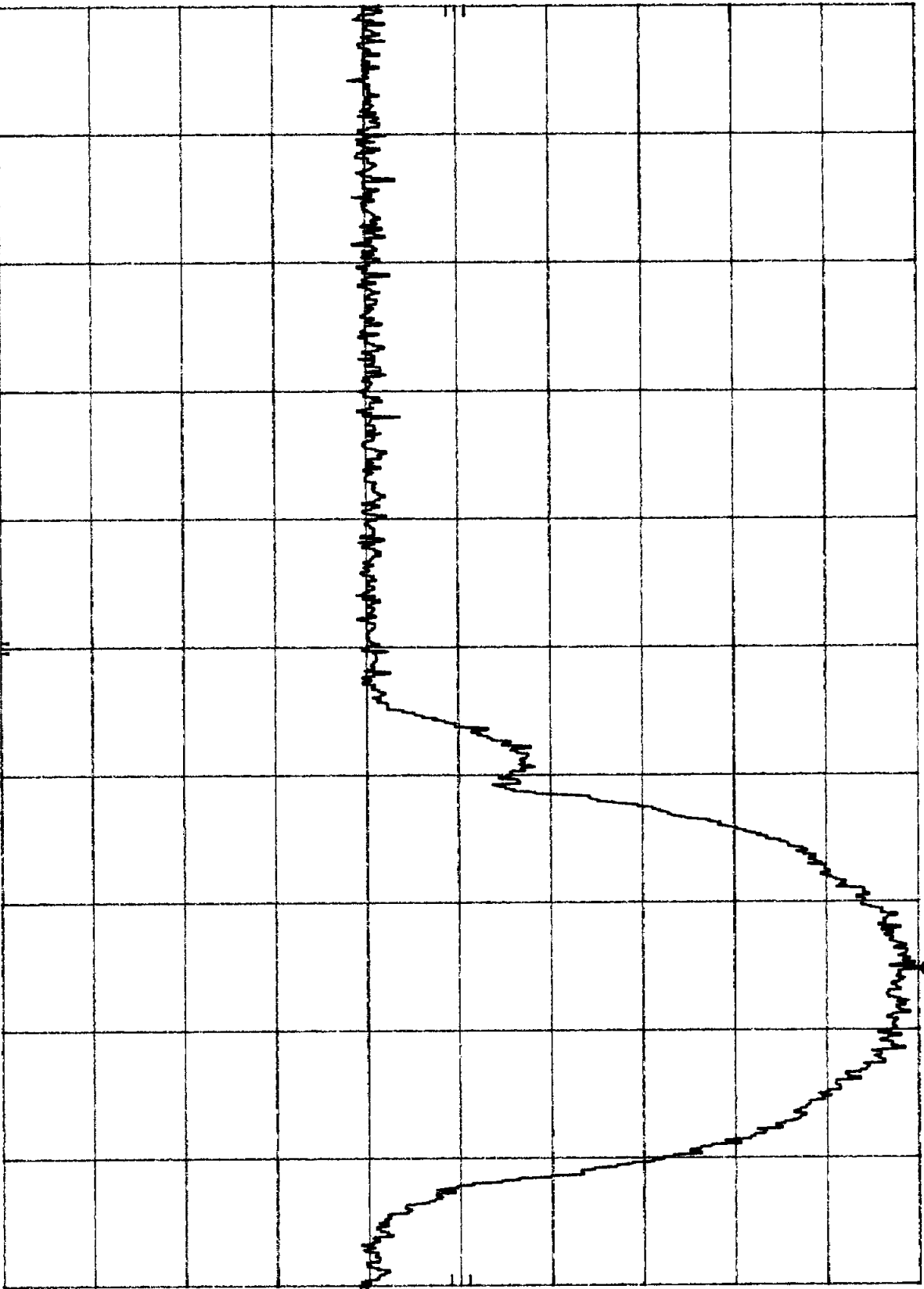
-61.30 DB

10 DB/

OFFSET

1.0

DB



START 2.400 0 GHz

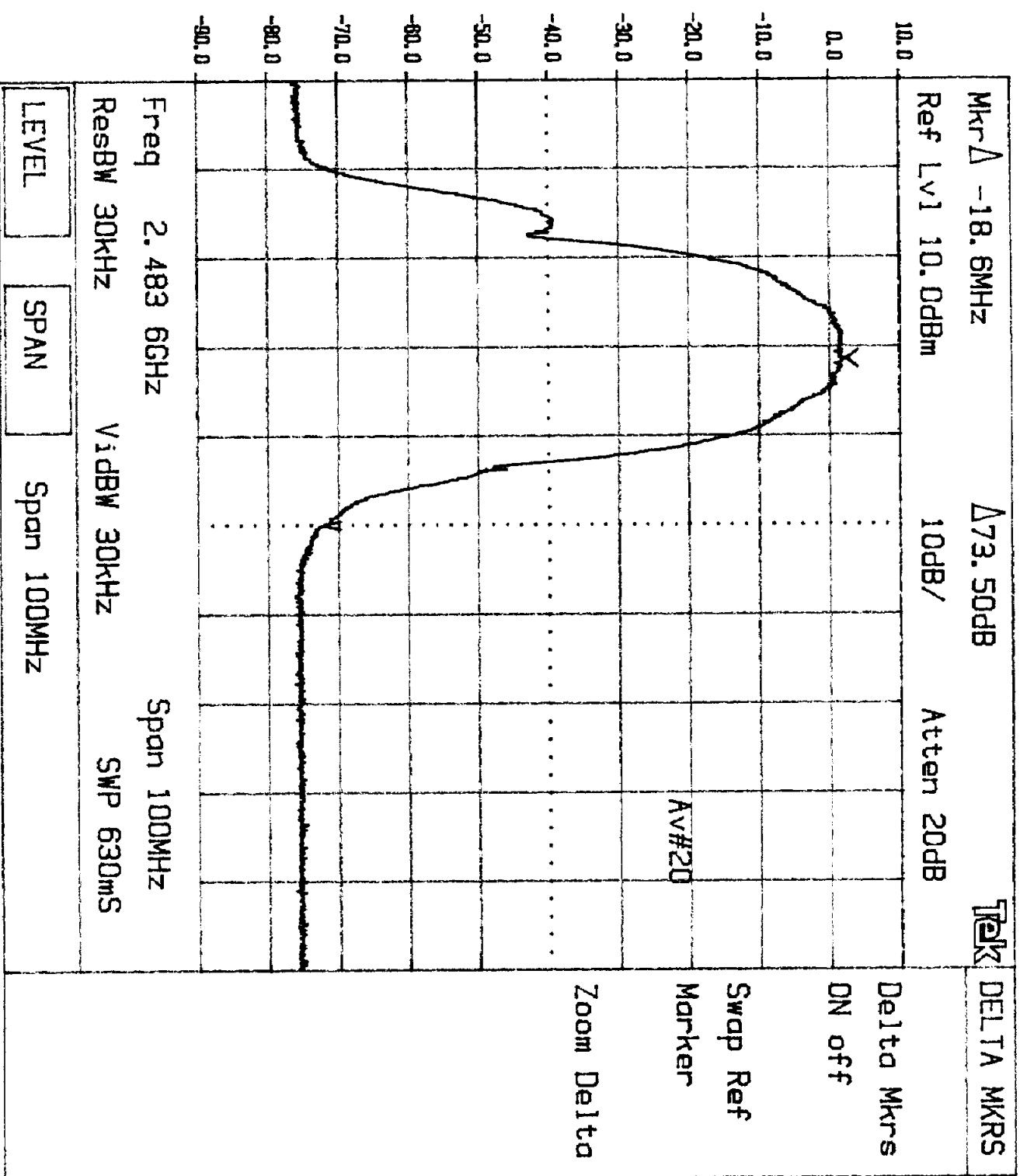
RES BW 100 KHz

VBW 100 KHz

STOP 2.483 5 GHz

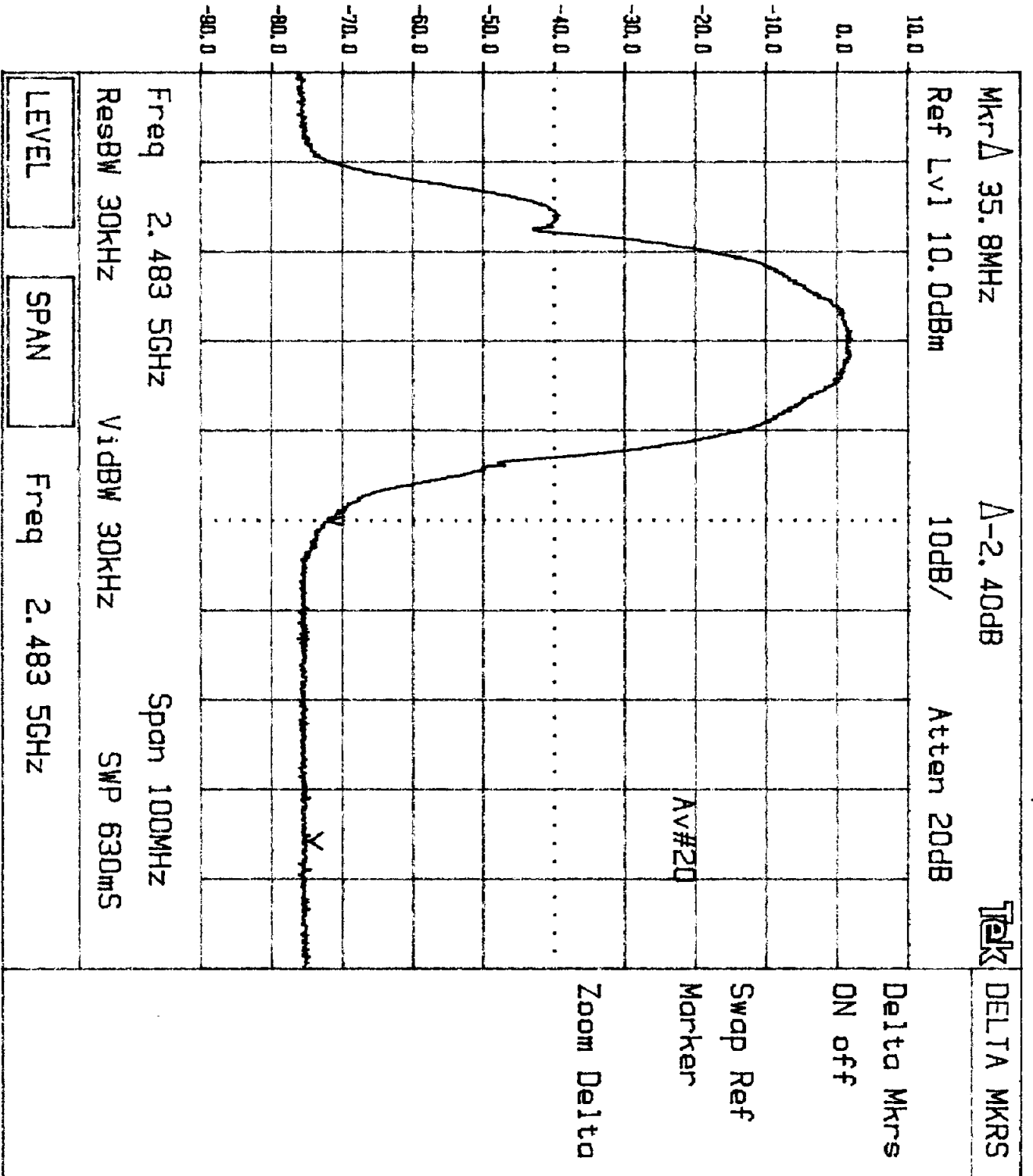
SWP 25.1 msec

4.b.4



Knob 2 Knob 1 Keypad Tektronix 2784

4.6.5



Knob 2 Knob 1 Keypad Taktronix 2784

HP

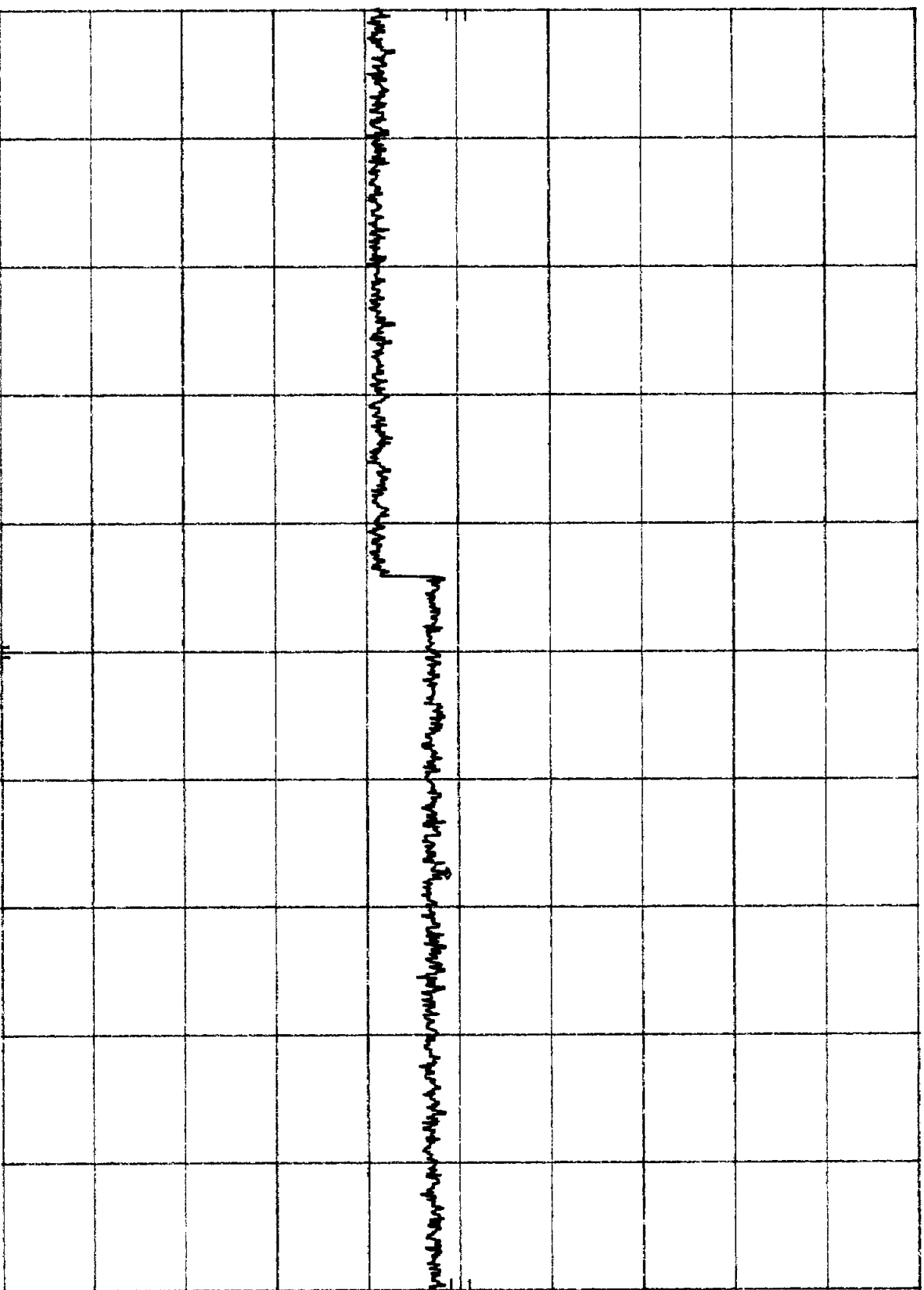
REF 12.0 dBm ATTEN 40 dB

4.b.6

MKR 7.542 GHz
-39.30 dBm

10 dB/

OFFSET
1.0
dB



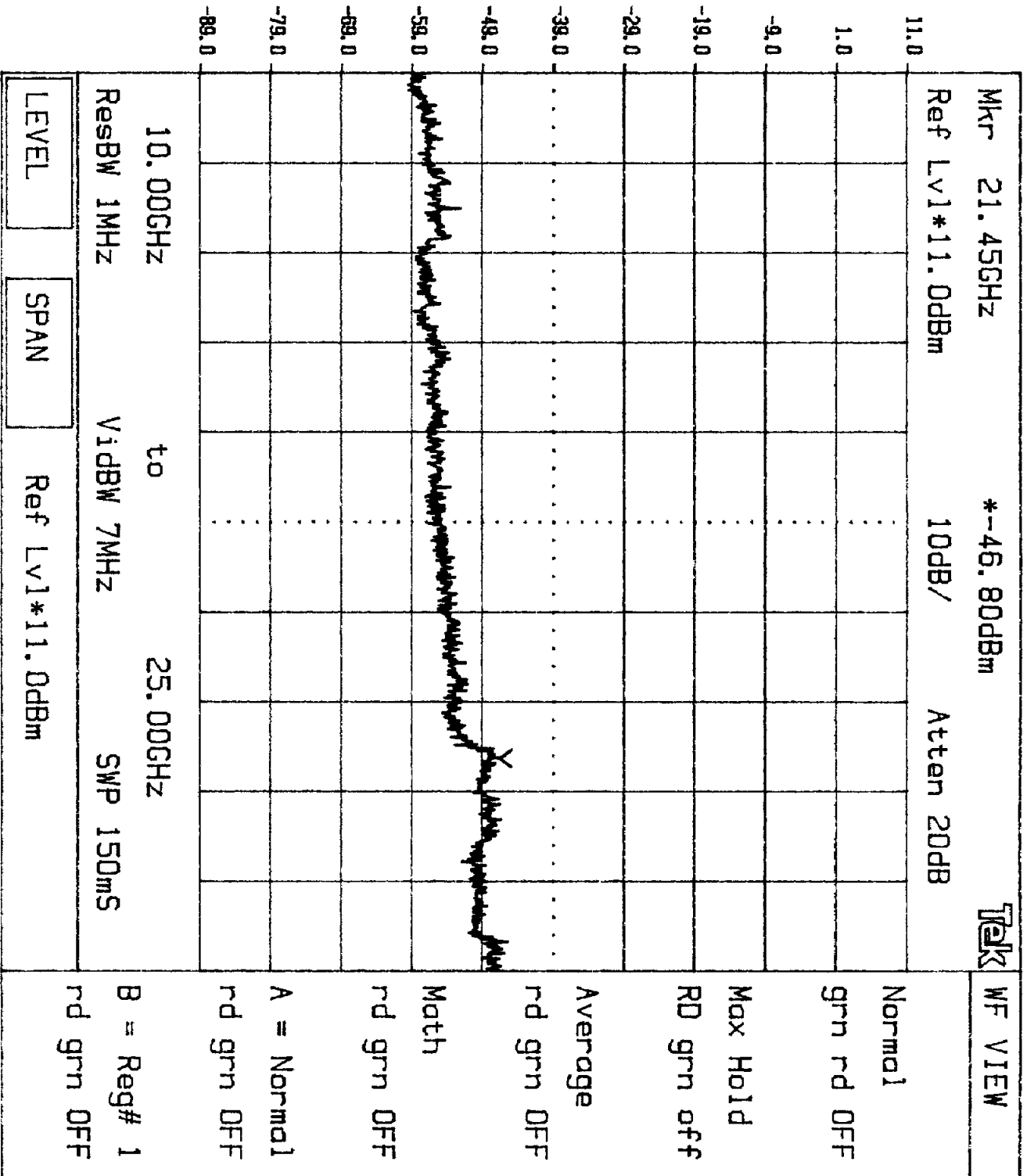
START 2.48 GHz

RES BW 100 KHz

VBW 100 KHz

STOP 10.00 GHz
SWP 2.25 sec

4. b. 7



KN0B 2 KN0B 1 KEYPAD Tektronix 2784

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4.5 Out of Band Radiated Emissions (for emissions in 4. above that are less than 26 dB below carrier), FCC Rule 15.247(c):

For out of band emissions that are close to the 20 dB attenuation requirement described in the specification, radiated measurements were performed at a 3 m separation distance to determine whether these emissions complied with the general radiated emission requirement.

- Not required
- See attached data sheet

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4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b), (c):

Radiated emission measurements were performed from 30 MHz to 24000.00 MHz. Analyzer resolution is 100 kHz or greater for 30 MHz to 1000 MHz, 1 MHz for >1000 MHz.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak and average detection.

To show compliance on the band edge frequency (2483.5 MHz) and up to 2500 MHz, the "delta" method was used. See notes on the next page. The same method was used to show compliance in the band 2310-2390 MHz.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Radiated Emissions Test Data

Company: Glenayre Western Multiplex	Model #: Ten BaseT+2xT1	Standard	FCC § 15.247 (R.B.)
EUT:	S/N #:	Limits	11
Project #:	Test Date: November 10, 1999	Test Distance	3 meters
Test Mode: Tx @ 2461.0 MHz	Engineer: Xi-Ming Y.	Duty Relaxation	0 dB

Number	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
	2	8	10	8	10	0	12	0	0	0
Model:	EMCO 3143	EMCO 3115	EMCO 3104	CDL_P100 0	APT1565	None	Grn_M+L	None	None	None

Frequency	Reading	Detector	Ant #	Amp #	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D.C.F.	Net	Limit @3m	Margin
MHz	dB(uV)	P/A/G	#	#	H/V	dB(1/m)	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
2462.25	106.4	Peak	8	0	V	29.6	0.0	2.3	0.0	138.3	74.0	64.3
2462.25	97.9	Ave.	8	0	V	29.6	0.0	2.3	0.0	129.8	54.0	75.8
2483.50										61.1*	74.0	-12.9
2483.50										52.6*	54.0	-1.4
4922.00	33.1	Peak	8	8	V	33.5	28.1	3.2	0.0	41.7	74.0	-32.3
4922.00	22.7	Ave.	8	8	V	33.5	28.1	3.2	0.0	31.3	54.0	-22.7
7383.00	36.0	Peak	8	8	V	38.0	28.0	4.3	0.0	50.3	74.0	-23.7
7383.00	26.3	Ave.	8	8	V	38.0	28.0	4.3	0.0	40.6	54.0	-13.4
12305.00	42.0	Peak	8	10	V	42.5	39.1	5.9	0.0	51.3	74.0	-22.8
12305.00	32.0	Ave.	8	10	V	42.5	39.1	5.9	0.0	41.3	54.0	-12.8
19688.00	41.0	Peak	21	13	V	40.3	23.3	6.5	-9.5	55.0	74.0	-19.0
19788.00	31.0	Ave.	21	13	V	40.3	23.3	6.5	-9.5	45.0	54.0	-9.0
22149.00	43.0	Peak	21	13	V	40.3	23.3	7.0	-9.5	57.5	74.0	-16.5
22149.00	33.0	Ave.	21	13	V	40.3	23.3	7.0	-9.5	47.5	54.0	-6.5

- Notes:**
- a) D.C.F.: Distance Correction Factor
 - b) Insert. Loss (dB) = Cable A + Cable B + Cable C.
 - c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
 - d) Negative signs (-) in Margin column signify levels below the limits.
 - e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.
 - f) Readings with * is calculated by using plots 4.b.4 and 4.b.5. The signal to noise ratio on the band-edge frequencies is too low (2.4 dB see plot number 4.b.5). In this case we can calculated the signal by subtracting 3.7 dB from signal plus noise level. Therefore the actual delta is 3.7dB higher than shown on the plot 4.b.4, 73.5+3.7=77.2dB delt.
 - g) Readings above 19 GHz were made at 1 m distance and with 100 KHz Resolution Bandwidth

Radiated Emissions Test Data

Company: Glenayre Western Multiplex	Model #: Ten BaseT+2xT1	Standard: FCC 47 CFR 15.247 (R.B.)
EUT:	S/N #:	Limits: 11
Project #:	Test Date: November 10, 1999	Test Distance: 3 meters
Test Mode: Tx @ 2411.5 MHz	Engineer: Xi-Ming Y.	Duty Relaxation: 0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	2	8	10	8	10	0	12	0	0	0
Model:	EMCO 3143	EMCO 3115	EMCO 3104	CDL P100 D	AFT18655	None	Gm M-L	None	None	None

Frequency	Reading	Detector	Ant	Amp	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/G	#	#	H/V	dB(1m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
2412.75	106.6	Peak	8	0	V	29.6	0.0	2.3	0.0	138.5	74.0	64.5
2412.75	98.3	Ave.	8	0	V	29.6	0.0	2.3	0.0	130.2	54.0	76.2
2390.00										53.9*	74.0	-20.1
2390.00										45.6*	54.0	-8.4
4823.00	33.1	Peak	8	8	V	33.5	28.1	3.2	0.0	41.7	74.0	-32.3
4823.00	22.7	Ave.	8	8	V	33.5	28.1	3.2	0.0	31.3	54.0	-22.7
7234.50	36.5	Peak	8	8	V	38.0	28.0	4.3	0.0	50.8	74.0	-23.2
7234.50	26.0	Ave.	8	8	V	38.0	28.0	4.3	0.0	40.3	54.0	-13.7
12057.50	42.5	Peak	8	10	V	42.5	39.1	5.9	0.0	51.8	74.0	-22.3
12057.50	32.5	Ave.	8	10	V	42.5	39.1	5.9	0.0	41.8	54.0	-12.3
19292.00	41.0	Peak	21	13	V	40.3	23.3	6.5	-9.5	55.0	74.0	-19.0
19292.00	31.0	Ave.	21	13	V	40.3	23.3	6.5	-9.5	45.0	54.0	-9.0
21703.50	43.0	Peak	21	13	V	40.3	23.3	7.0	-9.5	57.5	74.0	-16.5
21703.50	33.0	Ave.	21	13	V	40.3	23.3	7.0	-9.5	47.5	54.0	-6.5

- Notes:**
- a) D.C.F.:Distance Correction Factor
 - b) Insert. Loss (dB) = Cable A + Cable B + Cable C.
 - c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
 - d) Negative signs (-) in Margin column signify levels below the limits.
 - e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.
 - f) Readings with * is calculated by using plots 4.a.3 and 4.a.4. The signal to noise ratio on the band-edge frequencies is too low (1.0 dB see plot number 4.a.3). In this case we can calculated the signal by subtracting 6.87 dB from signal plus noise level. Therefore the actual delta is 6.87dB higher than shown on the plot 4.b.4, 77.8+6.8=84.6dB delta.
 - g) Readings above 19 GHz were made at 1 m distance and with 100 KHz Resolution Bandwidth

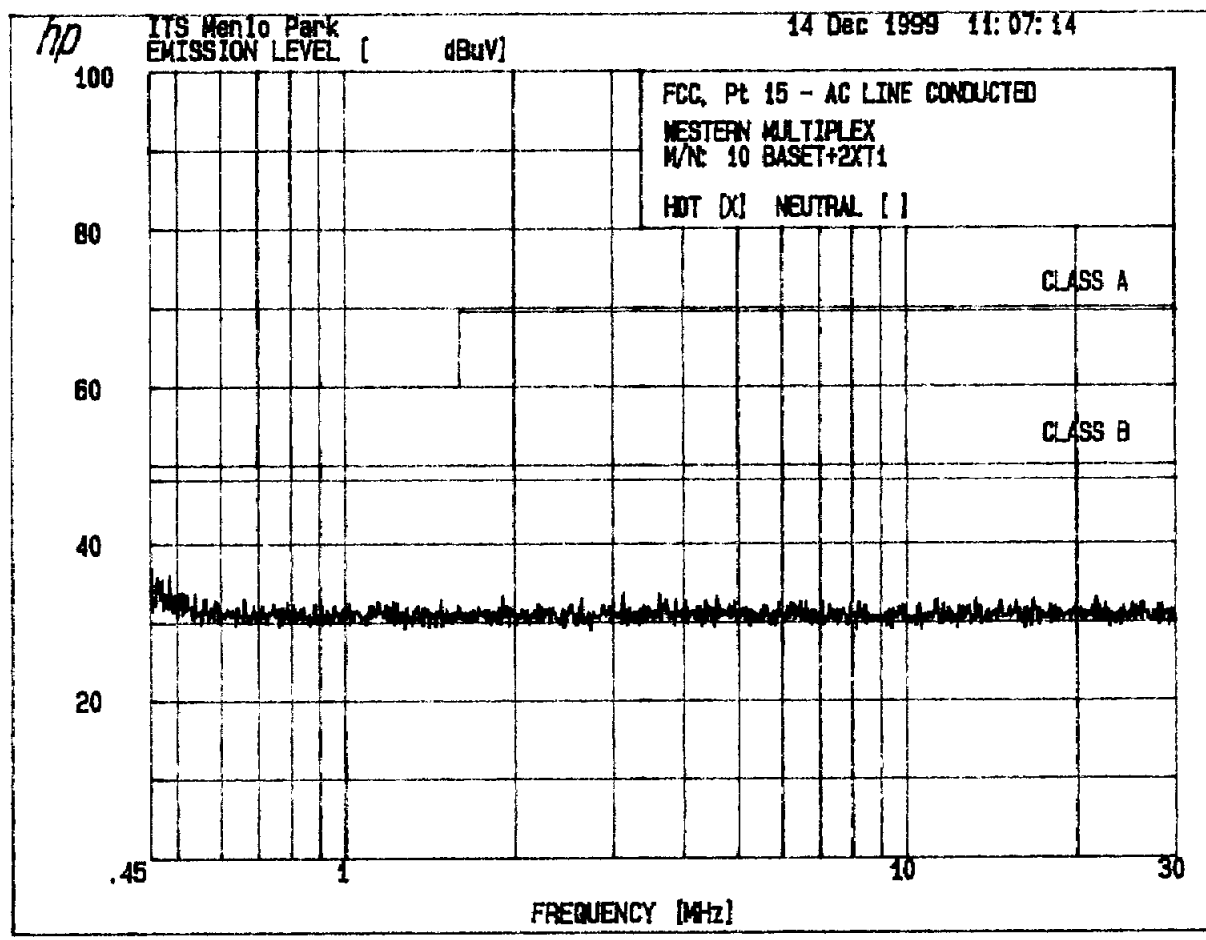
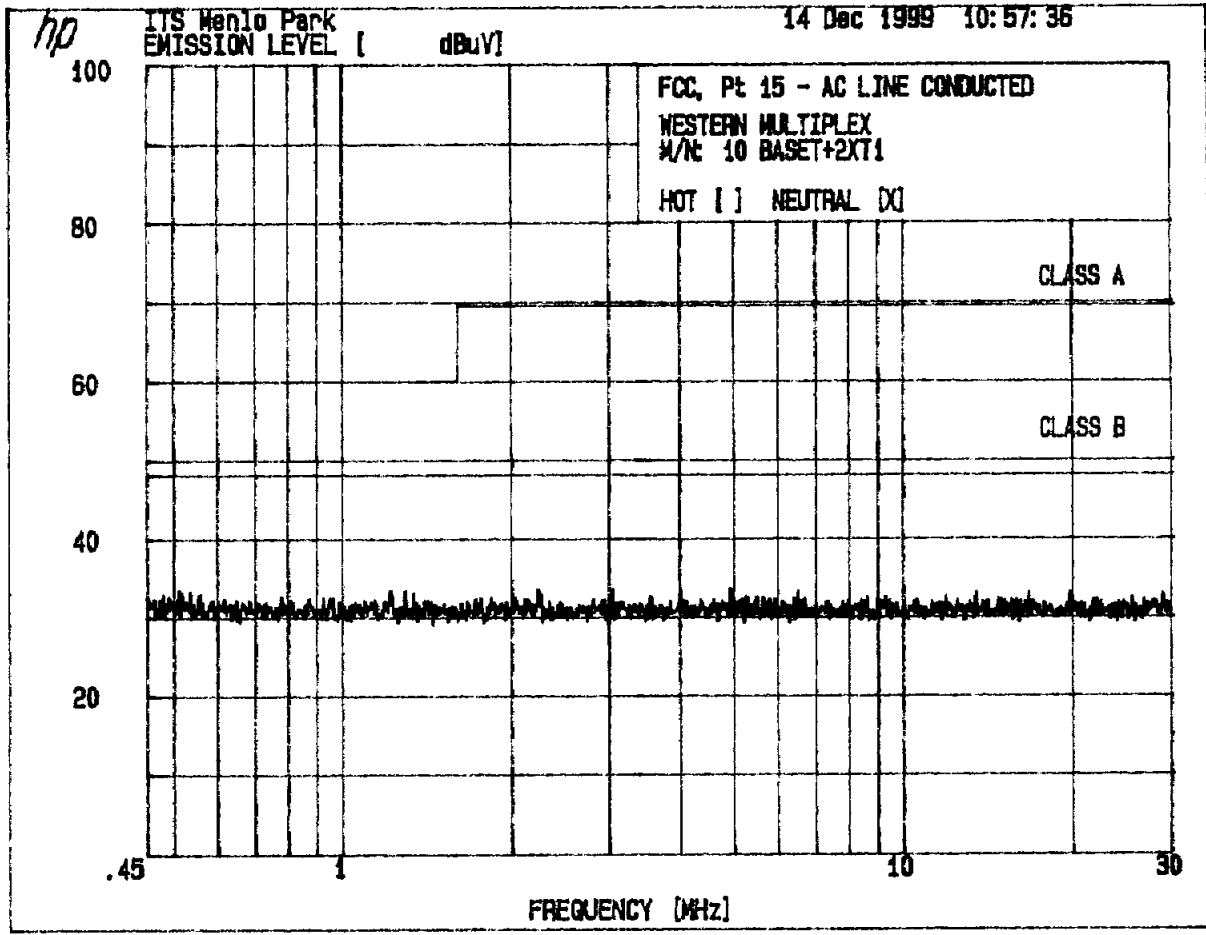
Glenayre Western Multiplex, Model No.
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Date of Test: November 10& 23 and December 14, 1999

4.7 AC Line Conducted Emission, FCC Rule 15.207:

Not required; battery operation only

Test data attached



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4.8 Radiated Emissions from Digital Section of Transceiver (Transmitter), FCC Ref: 15.109

- Not required - No digital part
- Test results are attached
- Included in the separate DOC report.

Radiated Emissions Test Data

Company: Glenayre Western Multiplex	Model #: Ten BaseT+2xT1	Standard: FCC § 15.209	
EUT:	S/N #:	Limits: 3	
Project #: J9902883	Test Date: November 23, 1999	Test Distance: 3 meters	
Test Mode: Tx	Engineer: Xi-Ming Y.	Duty Relaxation: 0 dB	

	Antenna Used			Pre-Amp Used		Cable Used			Transducer Used	
Number:	2	8	0	0	10	13	0	0	1	0
Model:	EMCO 3143	EMCO 3115	None	None	APT18656	ACO/400	None	None	Site 1	None

Frequency MHz	Reading dB(μV)	Detector P/A/Q	Ant. Amp.		Ant. Pol. H/V	Ant. Factor dB(1m)	Pre-Amp dB	Insert. Loss dB	D. C. F. dB	Net dB(μV/m)	Limit @3m dB(μV/m)	Margin dB
			#	#								
40.00	27.0	Peak	2	0	V	7.1	0.0	0.7	0.0	34.8	40.0	-5.2
141.13	23.0	Peak	2	0	V	10.0	0.0	1.0	0.0	34.0	43.5	-9.5
344.70	25.0	QP	2	0	H	15.1	0.0	1.7	0.0	41.8	46.0	-4.2
371.20	24.5	QP	2	0	H	15.7	0.0	2.2	0.0	42.4	46.0	-3.6
467.76	20.4	Peak	2	0	H	17.7	0.0	2.0	0.0	40.1	46.0	-5.9
482.07	20.1	Peak	2	0	H	18.2	0.0	2.0	0.0	40.3	46.0	-5.7
523.72	16.0	Peak	2	0	V	18.6	0.0	2.2	0.0	36.8	46.0	-9.2
662.83	13.4	Peak	2	0	V	19.8	0.0	2.8	0.0	36.0	46.0	-10.0

Notes:

- a) D.C.F.: Distance Correction Factor
- b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
- c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
- d) Negative signs (-) in Margin column signify levels below the limits.
- e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

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- 4.9 Radiated Emissions from Receiver Section of Transceiver (L.O. Radiation), FCC Ref: 15.109, 15.111
- Not required - EUT operation above 960 MHz only
 - Not required - EUT is transmitter only
 - Not performed; exempt until June 1999
 - Test results are attached

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Date of Test: November 10& 23 and December 14, 1999

4.10 Processing Gain Measurements, FCC Rule 15.247(e)

The processing gain shall be determined from the ratio in dB of the signal to noise ratio with the system spreading code turned OFF, to the signal to noise ratio with the system spreading code turned ON, as measured at the demodulated output of the receiver. The processing gain shall be at least 10 dB for a direct sequence spread spectrum system.

	Refer to attached test procedure and data sheets.
	Refer to circuit analysis and processing gain calculations provided by manufacturer.
X	Refer to Exhibit 13 of FCC Application

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Date of Test: November 10& 23 and December 14, 1999

4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEEP function on the analyzer was set to ZERO SPAN. The transmitter ON time was determined from the resultant time-amplitude display:

Duty cycle = Maximum ON time in 100 msec/100

Duty cycle correction, dB = $20 * \log(\text{DC})$

	See attached spectrum analyzer chart(s) for transmitter timing
	See transmitter timing diagram provided by manufacturer
X	No duty cycle was applied

Glenayre Western Multiplex, Model No.
FCC ID: HZB-S24-12

Date of Test: November 10& 23 and December 14, 1999

5.0 Document History

Revision/Job Number	Date	Change
1.0 / J99028833	12/14/99	Original document